Visualizations for I-81/I-77 Location Study

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Parties Involved in Full Location Study

Virginia Tech:

- Center for Public Administration and Policy (CPAP)
- Dept. of Civil & Environmental Engineering (CEE) (Visualization)
- Urban Affairs and Planning (UAP)
- Dept. of Agricultural and Applied Economics
- Virginia Tech Transportation Institute (VTTI)

- Virginia Center for Innovative Technology (CIT)
- Town of Wytheville
- Virginia Dept. of Transportation (VDOT)
- Hayes, Seay, Mattern, & Mattern (HSMM)

Visualization Project Goal:

- To create 3-D visualizations of existing conditions and proposed routes for the new I-81/I-77 corridor in through Wythe County that can be presented to all parties involved, including the people of the Wytheville community.

** Constraints **

PC-based and low-budget

Project Location

Local Map:

AVI movie at
http://cegis.ce.vt.edu/projectwebs/wytheville/
under Animated Visualizations

Project Background

- I-81/I-77 Interchange and Corridor
  - 8-mile overlap of the two interstates.
  - Near town of Wytheville
- VDOT believes redesign is necessary for safety.
  - Significant increase in truck traffic (from 15% to 40%)
  - 58,000 vehicles/day
  - High accident rate

Key Concerns

- Any re-alignment of the roadways will have direct economic and developmental effects on the town of Wytheville and the surrounding areas.
  - Desire to maximize local development and minimize the negative economic impacts.
- Many citizens are concerned about new zoning and construction effects.

*Public needs to be involved in decisions!

Need for Visualizations

- Typically, topographic maps and survey or construction plans have been used in the past.
  - Difficult to understand for public or clients with non-engineering background.
- 3D visualizations facilitate the communication of existing and proposed conditions to the “layman”.

Available Data Types

- Elevation Data
- Survey Data
- Imagery

Elevation and Survey Data

- Planimetrics, contours, survey points and breaklines for interstate corridor (Microstation .dgn format) from VDOT.
- Planimetrics and Contours for the town of Wytheville (AutoCAD .dwg format) from the town engineer.
- LIDAR data (points and breaklines in Microstation .dgn format) and planimetrics for the interstate corridor from VDOT.
- USGS 30m DEM data.

Imagery Data

- Black and White Aerial Photos (.tif and .hmr formats) of the interstate corridor from VDOT.
- Black and White Aerial Photos (.tif format) of the town of Wytheville from the town engineer.
- Landsat 7 imagery of the area.
- Color-infrared Digital Ortho Quarter Quads (DOQQs).

Software Packages

1. ArcView GIS 3.2 3-D Analyst by ESRI, Inc.
2. ERDAS Imagine 8.4 Virtual GIS by ERDAS, Inc.
3. AutoCAD Land Development Desktop by Autodesk, Inc.
4. World Construction Set 5 by 3DNature, LLC.
5. EDGE Viewer by Autometric, Inc.

ArcView GIS – 3D Analyst Visualizations

Using LIDAR points and breaklines with planimetric overlays

Other screen captures at
http://cegis.ce.vt.edu/projectwebs/wytheville/
under Still Visualizations - ArcView

AutoCAD LDD Visualizations

Using AutoCAD contours and planimetrics for the town of Wytheville.

Interchange near Wytheville where I-81 and I-77 come together

Other screen captures at
http://cegis.ce.vt.edu/projectwebs/wytheville/
under Still Visualizations - AutoCAD

World Construction Set Visualizations

Using AutoCAD contours and planimetrics for the town of Wytheville.

Other screen captures at
http://cegis.ce.vt.edu/projectwebs/wytheville/ under
Still Visualizations – World Construction Set

ERDAS Imagine Virtual GIS Flythrough

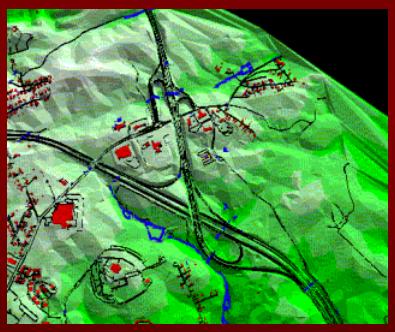
Using USGS DEMs overlaid with Digital Ortho Quarter Quads

- Starting at the easternmost intersection of the corridor.
- Traveling west toward the town of Wytheville.

AVI flythrough at
http://cegis.ce.vt.edu/projectwebs/wytheville/
under Animated Visualizations - ERDAS

ArcView GIS – 3D Analyst Flythroughs

Using AutoCAD contours and planimetrics for the town of Wytheville. (Left model draped with B&W orthophotos)



AVI flythroughs at
http://cegis.ce.vt.edu/projectwebs/wytheville/ under Animated Visualizations - ArcView

Westernmost intersection of the corridor. I-77 enters from the north and I-81 enters from the west. The northern interchange is where I-77 meets the main street of Wytheville

Problems Encountered

Realism difficult to achieve with data and software available.

- World Construction Set
  - Can import grid points but terrain is generated using a TIN and must have a certain projection and coordinate system.
  - If resolution is low, roads and other vectors are crossed with TIN lines.
  - Cannot extrude building outlines so difficult to add buildings.
- ArcView 3-D Analyst
  - Good navigation tools but no rendering capabilities.

Problems Encountered (Cont.)

Realism difficult to achieve with data and software available.

- AutoCAD Land Development Desktop
  - Difficult to handle large amounts of data.
  - Relatively little rendering capabilities.
- ERDAS Imagine Virtual GIS
  - Cannot extrude buildings.
  - No rendering capabilities.

Problems Encountered (Cont.)

Realism difficult to achieve with data and software available.

- LIDAR data extremely large
  - Could not work with entire corridor
  - Difficult to break up ground cover layers into smaller areas due to large ASCII file format.
- USGS DEM data contained a 1-pixel gap between the two sections.

Future Work

- Find more funding.
- Purchase additional software (Bentley, Multigen,…).
- Acquire additional data sets (imagery, RADAR,…).
- Improve the realism of these visualizations.
- Export visualizations to VRML for use on the web.
- When specific design information is provided for the proposed alternatives, new models will be created.
- Final group of models will be shown at committee meetings, etc. For public involvement and input.